KRUSE ELECTRONICS

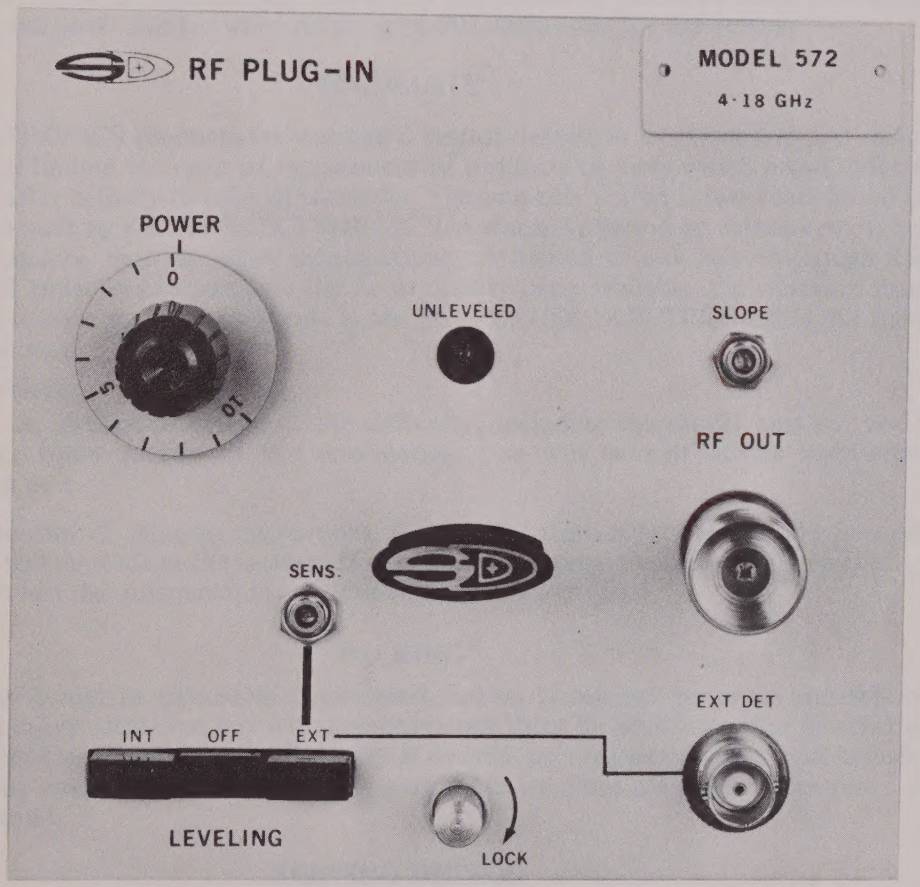
MODEL 572- 3 M2, M3

MULTIBAND RF PLUG-IN

SYSTRON DONNER

Kruse Electronics

PRELIMINARY INSTRUCTION MANUAL



KRUSE ELECTRONICS

MODEL 572- 3 M2, M30

MULTIBAND RF PLUG-IN

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KRUSE ELECTRONICS
DIVISION
SYSTRON DONNER
CORPORATION

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SHIPMENT DAMAGE

The instrument should be tested as soon as it is received. If it fails to operate properly or is damaged in any way, a claim must be filed with the carrier. Have carrier agent inspect damage to instrument and packing crate and forward us a copy of his written report. You will then be advised of replacement or repair arrangements and disposition of the equipment. Please include model number and serial number when referring to this instrument for any reason.

WARRANTY

KRUSE ELECTRONICS products are warranted against defects in workmanship and materials. This warranty is limited to repair or replacement of products or parts which prove defective in normal service after delivery to original purchaser. The warranty period is two years for all instruments and parts built by KRUSE ELECTRONICS. The warranty period on cathode ray tubes and YIG-tuned oscillators, built by other manufacturers, is limited to one year. Although KRUSE ELECTRONICS endeavors to purchase the finest quality parts available, the warranty from the manufacturer on these major components is one year. KRUSE ELECTRONICS is not liable for consequential damage.

If any fault develops:

1. Notify us, giving full details of the difficulty, including the model number, and serial number. Upon receipt of this information, you will be sent service instructions or shipping date.

2. Upon receipt of shipping instructions, forward the instrument prepaid and insured, and repairs will be made at the factory. If requested, an estimate will be made before the work begins when the instrument is not covered by this warranty.

PACKING

The instrument should be packed in the original carton. If original carton is unusable or not available, use a heavy cardboard box with approximately three inches of excelsior or other shock-absorbing material surrounding the instrument. If desired, packing services of a local transfer and storage company may be employed. Specific packing instructions are given in Section 2 of the instruction manual.

SHIPPING METHOD

This instrument should only be shipped by truck freight, rail freight, air freight, or parcel delivery service. If it is shipped by parcel post, damage is likely to occur. KRUSE ELECTRONICS is not responsible for units damaged in shipment to the factory for repair, whether such units are in warranty or not.

INSURANCE

Insure the unit for full value whenever it is shipped.

LIST OF EFFECTIVE PAGES

PAGE	CHANGE
i	Original
ii	Original
iii	Original
iv	Original
1-1 through 1-4	Original
2-1 through 2-2	Original
3-1 through 3-8	Original
4-1 through 4-4	Original
5-1 through 5-4	Original
6-1	Original
6-2	Blank

NOTE 1) All Original pages are dated 3-7-73 (March 7, 1973)

NOTE 2) Please report errors and omissions in this manual to Kruse Electronics division of Systron-Donner Corporation, 735 Palomar Avenue, Sunnyvale, California 94086. This report should include the manual title, date of last change, and exact location (by page, paragraph, line, or figure) of the error. Also include the model number, serial number, and numbers of modifications or options (if any) pertinent to your instrument.

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SECTION 1

INTRODUCTION AND DESCRIPTION

1.1 SCOPE OF MANUAL

This preliminary manual is supplied to provide operating information, specifications, and schematic diagrams for all 572 series RF plug-ins other than 572-104. Refer to the 540 Multiband Sweeper manual for information pertaining to the sweeper mainframe. Permanent instruction manuals, when available, will include application information, operating instructions, theory of operation, and maintenance instructions.

A permanent manual will be sent to replace this preliminary manual upon written request; such request must include the model number and serial number of the plug-in and the complete address to which the manual should be sent.

This manual describes 572 series plug-ins with Option M30, continuous sweep.

1.2 DESCRIPTION

Model 570 series RF plug-ins are used in the Kruse Model 540 Multiband Sweeper; 572 RF plug-ins are multiband 1 to 18 GHz generators with the capability of sweeping up to three bands individually or continuously.

The oscillators used as sources for each band are solid state, fundamental frequency types; there are no frequency multipliers or BFO's used in the 572 series plug-ins. The RF output may be leveled externally or internally, or the plug-in may be operated unleveled.

Major components of the Model 572 RF plug-in, as shown in Figure 1.1, include a continuous (sequential) sweep mother board which contains all the amplitude modulation circuits including the leveling circuits, three plug-in YIG (oscillator) driver boards which shape the frequency-controlling voltage, three oscillator modules which generate the RF signals, three coaxial isolators which protect the oscillators from mismatch damage, and a combination band switch/modulator assembly. This assembly uses PIN diodes for oscillator selection and amplitude control. Option M2 units include a wideband directional coupler/crystal detector assembly for internal power leveling.

The plug-in YIG driver boards are basically identical assemblies, but the values of "select by test" components are different, as each board is custom-tailored for the oscillator module it drives. Therefore, although the boards bear identical assembly numbers, they are not interchangeable, and boards from other 572 RF plug-ins may not be used as replacements.

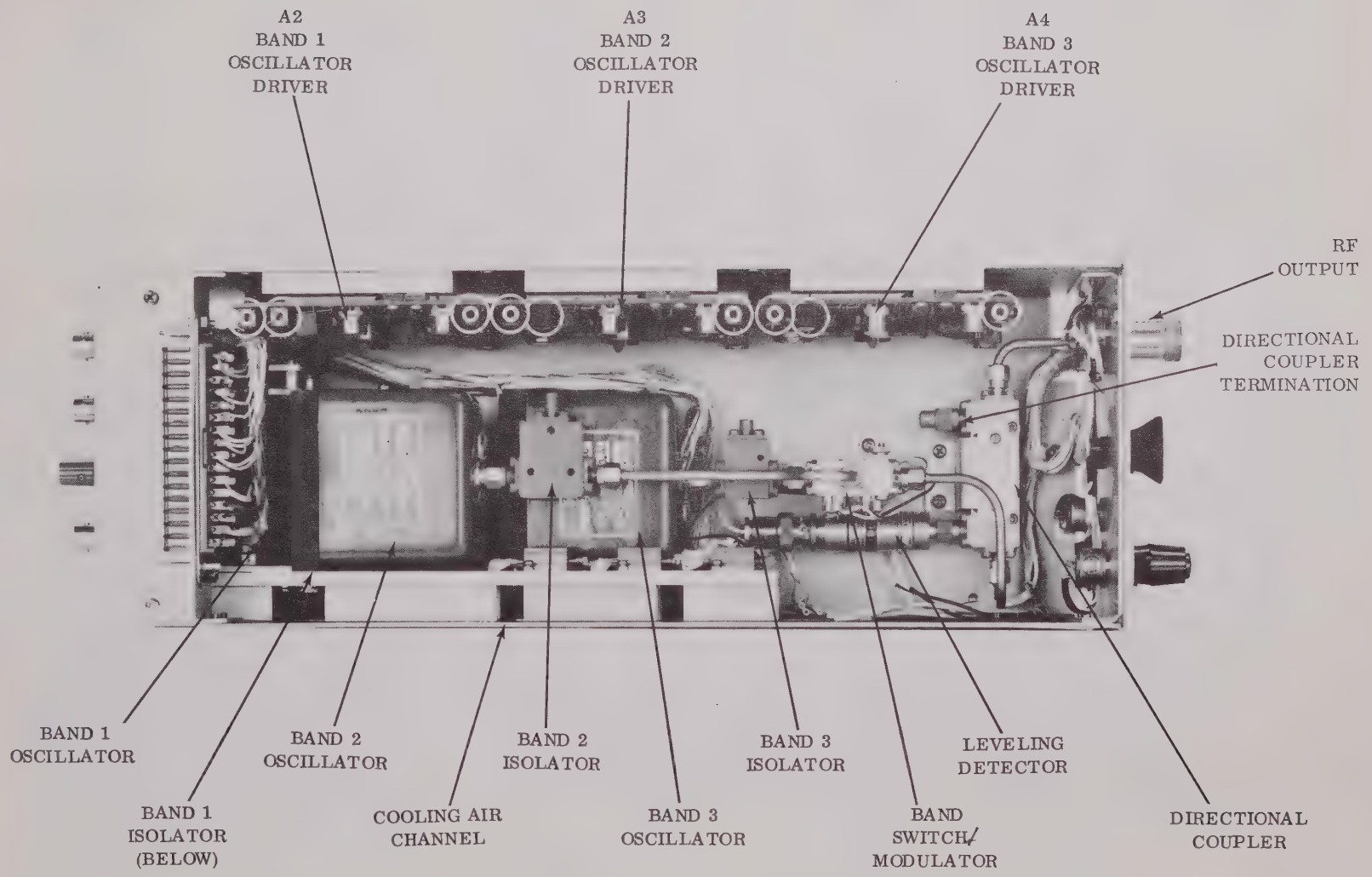

Figure 1.1 Model 572 RF Plug-in Major Components

1.3 OPTIONS

Optional configurations of the Model 572 RF plug-in can be constructed to meet special requirements of power, frequency coverage, etc. Contact the factory for details. Three options are currently available:

1.3.1 Option M2, Internal Leveling. Option M2 adds an internal directional sampler for power leveling. Output flatness is ±1.0 dB maximum at the rated output.

1.3.2 Option M26, Rear Connectors. The RF output connector is moved from the front to the rear panel. A "BNC" connector is added to the rear for external leveling detector input.

1.3.3 Option M30, Continuous Sweep. Units with this option installed are capable of continuously generating a very wide sweep of all available bands. The Model 572, for example, contains three oscillators covering 4 - 18 GHz, 8 - 12.4 GHz, and 12.4 - 18 GHz When a Model 572 M30 is used, and the 540 BAND SELECT switch is set to "4", the plug-in sweeps continuously from 4 to 18 GHz.

1.4 ACCESSORIES

The accessories listed below may be ordered separately:

1.4.1 Leveling Cable Model 9105. A 24-inch cable with a male Type BNC connector on one end and a Sealectro connector on the other, this accessory is used with some Kruse external samplers.

1.4.2 Phase Lock Plug Model 9106. Miniature plug mates with rear panel PHASE LOCK connector; one is supplied for each band.

1.4.3 Coaxial Adapter Model 9132. This unit is a Type N female to 3 mm (SMA) male connector adapter.

1.4.4 Coaxial Adapter Model 9137. This unit is a Type N male to 7 mm precision (APC-7) sexless connector adapter.

1.4.5 Model 593 Flexible Plug-in Extension. The 572 RF Plug-in may be operated outside the 540 mainframe using this three-foot extension cable; access to the plug-in for maintenance or calibration is otherwise severely limited.

1.5 SPECIFICATIONS

The specifications for currently-available standard 572 series RF plug-ins are listed in Table 1.1; specifications for special plug-ins will be supplied upon request.

Table 1.1 Model 572 Specifications

Plug-In Model Number	Frequency Range					Power Output (Minimum) at Full Output, 50Ω Load		Power Variation vs. Frequency at Full Output, 50Ω Load				Spurious Signals, below Full Output Harmonic/ Non-Harmonic (@ > 1 MHz from Carrier) (dB)
	Rated	Band 1	Band 2	Band 3	Band 4	Leveled (mW)	Un-leveled (mW)	Un-leveled (±dB)	Leveled, Internal Sampler (±dB)	Leveled, External Sampler (±dB)	External Sampler Model	
572[3]	4.0-18.0 GHz	3.9- 8.1 GHz	7.9-12.5 GHz	12.3-18.1 GHz	3.9-18.1 GHz[4]	3[1]	4	4	---	1.5	1021	20/60
572-M2	4.0-18.0 GHz	3.9- 8.1 GHz	7.9-12.5 GHz	12.3-18.1 GHz	3.9-18.1 GHz[4]	3	-	4	1.0	1.5	1021	20/60
572-3[3]	4.0-11.0 GHz	3.9- 7.1 GHz	6.9-11.1 GHz	--	3.9-11.1 GHz[4]	3[1]	5	4	---	1.5	1021-1	20/45
572-3M2	4.0-11.0 GHz	3.9- 7.1 GHz	6.9-11.1 GHz	--	3.9-11.1 GHz[4]	3	-	4	1.0	1.5	1021-1	20/45
572-4[3]	8.0-18.0 GHz	7.9-12.5 GHz	12.3-18.1 GHz	--	7.9-18.1 GHz[4]	3[1]	4	4	---	1.0	1021	30/60
572-4M2	8.0-18.0 GHz	7.9-12.5 GHz	12.3-18.1 GHz	--	7.9-18.1 GHz[4]	3	-	4	1.0	1.0	1021	30/60
572-5[3]	4.0-12.4 GHz	3.9- 8.1 GHz	7.9-12.5 GHz	--	3.9-12.5 GHz[4]	3[1]	4	4	---	1.0	1020	20/60
572-5M2	4.0-12.4 GHz	3.9- 8.1 GHz	7.9-12.5 GHz	--	3.9-12.5 GHz[4]	3	-	4	1.0	1.0	1020	20/60

Plug-In Model Number	Frequency Accuracy at 25°C Full Output, Single Band Operation (MHz[2])	Frequency Accuracy at 25°C Full Output, Continuous Band Operation (MHz[2])	Residual AM Index at Full Output (dB)	Residual FM Deviation 1 Hz to 30 kHz		Frequency Stability, % of Output Frequency				Source VSWR (Max.) at Any Output Level	Δ F Range (Max.) (±MHz)	Output Connector Type
				CW Mode Peak (kHz)	Sweep Mode Peak (kHz)	vs Temp Change (%/°C)	vs Load VSWR 1:1 to 3:1 (±%)	vs 6 dB RF Power Change (±%)	vs 10% Line Change (±%)			
572[3]	±1%	±2%	-46	35	70	±0.05	0.3	0.25	0.001	2.0:1	700	7 mm
572-M2	±1%	±2%	-40	35	70	±0.05	0.3	0.25	0.001	2.0:1	700	7 mm
572-3[3]	±1%	±2%	-46	40	70	±0.05	1.0	0.25	0.001	2.0:1	350	N
572-3M2	±1%	±2%	-40	40	70	±0.05	1.0	0.25	0.001	2.0:1	350	N
572-4[3]	±1%	±2%	-46	35	70	±0.05	0.3	0.25	0.001	2.0:1	500	7 mm
572-4M2	±1%	±2%	-40	35	70	±0.05	0.3	0.25	0.001	2.0:1	500	7 mm
572-5[3]	±1%	±2%	-46	35	70	±0.05	0.3	0.25	0.001	2.0:1	420	N
572-5M2	±1%	±2%	-46	35	70	±0.05	0.3	0.25	0.001	2.0:1	420	N

[1] Using Models 1020 to 1036 Directional Samplers

[2] Percent of indicated value

[3] Specifications shown here are typical for units with the continuous sweep option -- M30

[4] Continuous sweep band

SECTION 2

INITIAL INSTRUCTIONS

2.1 UNPACKING AND INSPECTION

The instrument is shipped in a specially constructed container to provide maximum protection to the equipment during transit. Use care when unpacking to prevent damage to the equipment, such as cabinet finish, controls, indicators, connectors, etc.

2.1.1 Removing Contents. To remove the instrument from the shipping container, cut and fold back outer carton top flaps, remove top protective cushion, lift instrument clear from shipping container, open dust protection bag, and remove equipment.

2.1.2 Inspection. The instrument was carefully tested and inspected prior to shipment. Inspect the instrument for damage incurred during shipment. If the instrument is damaged in any way, see the warranty and repair notices at the front of this manual.

2.2 PREPARATION FOR USE

Each RF plug-in is supplied with a metal dial drum for frequency readout in the 540 sweeper:

a. Insert the RF plug-in into the rectangular hole at the right-hand side of the 540.

b. Lock the plug-in in place by turning the small knob at the bottom CW.

c. If necessary, install a new dial drum in the 540, following steps d through h.

d. Remove the top cover of the instrument; it is held in place with two screws.

e. Face the instrument, holding the dial scale drum with its gear to the left and smooth, rounded end knob to the right.

f. Push the smooth knob into its mating receptacle near the plug-in compartment shield. The spring will give way, allowing you to lower the left side of the drum.

g. Snap the drum into place and align the locating key with the mating groove in the left side of the drum assembly.

h. Rotate the BAND SELECT knob to ensure smooth operation of the drum assembly.

2.3 REPACKAGING FOR SHIPMENT

If the instrument is to be packaged for re-shipment, use the original shipping container and packaging. If the original packaging has been discarded or is not in condition for re-use, perform the following packaging procedure:

a. Wrap the instrument in a heavy paper wrapping or plastic protective covering.

b. Place a protective cushion in the bottom of the shipping carton and place the instrument on the cushion.

c. Surround the remaining sides and top with additional protective cushions to provide support of the instrument without resting it on the controls or connectors.

2.4 SHIPPING METHOD

This instrument should be shipped only by truck freight, rail freight, air freight, or parcel delivery service. If it is shipped by parcel post, damage is likely to occur. Kruse Electronics is not responsible for units damaged in shipment to the factory for repair, whether such units are in warranty or not.

2.5 INSURANCE

Insure the unit for full value whenever it is shipped.

2.6 RETURNS FOR REPAIR

Be sure to fully identify any instrument that is returned to Kruse Electronics for repair of any kind, in-warranty or not. The paperwork with the unit must show the instrument serial number, malfunction or problem to be corrected, and the exact address to which the instrument should be returned when repairs are completed.

SECTION 3

OPERATION

3.1 GENERAL

This section contains instructions for the operation and applications of a 572 Plug-in; the functions and uses of the controls and indicators are described, as are typical applications for the instrument.

CAUTION

TO AVOID POSSIBLE DAMAGE TO THE INSTRUMENT, DO NOT ATTEMPT TO OPERATE IT UNTIL YOU HAVE READ AND UNDERSTOOD THIS SECTION.

3.2 CONTROLS, INDICATORS, AND CONNECTORS

The various front and rear-panel controls, indicators, and connectors are shown in Figures 3.1 and 3.2 and described in Tables 3.1 and 3.2.

Table 3.1 Front Panel Controls, Indicators, and Connectors

FIG. 3.1 INDEX	ITEM	FUNCTION
1	POWER Control	Black knob/potentiometer. Controls the RF output amplitude of all bands of the plug-in. This control typically has a range of over 30 dB, unleveled.
2	RF OUT Connector	Precision Type N or 7 mm Connector. The RF output is fed to this point; output impedance is 50 Ω.
3	SLOPE Adjustment	Screwdriver-adjust potentiometer. Used to set amount of slope compensation at high end of sweep to overcome 6 dB/octave rolloff characeristics of coaxial devices.

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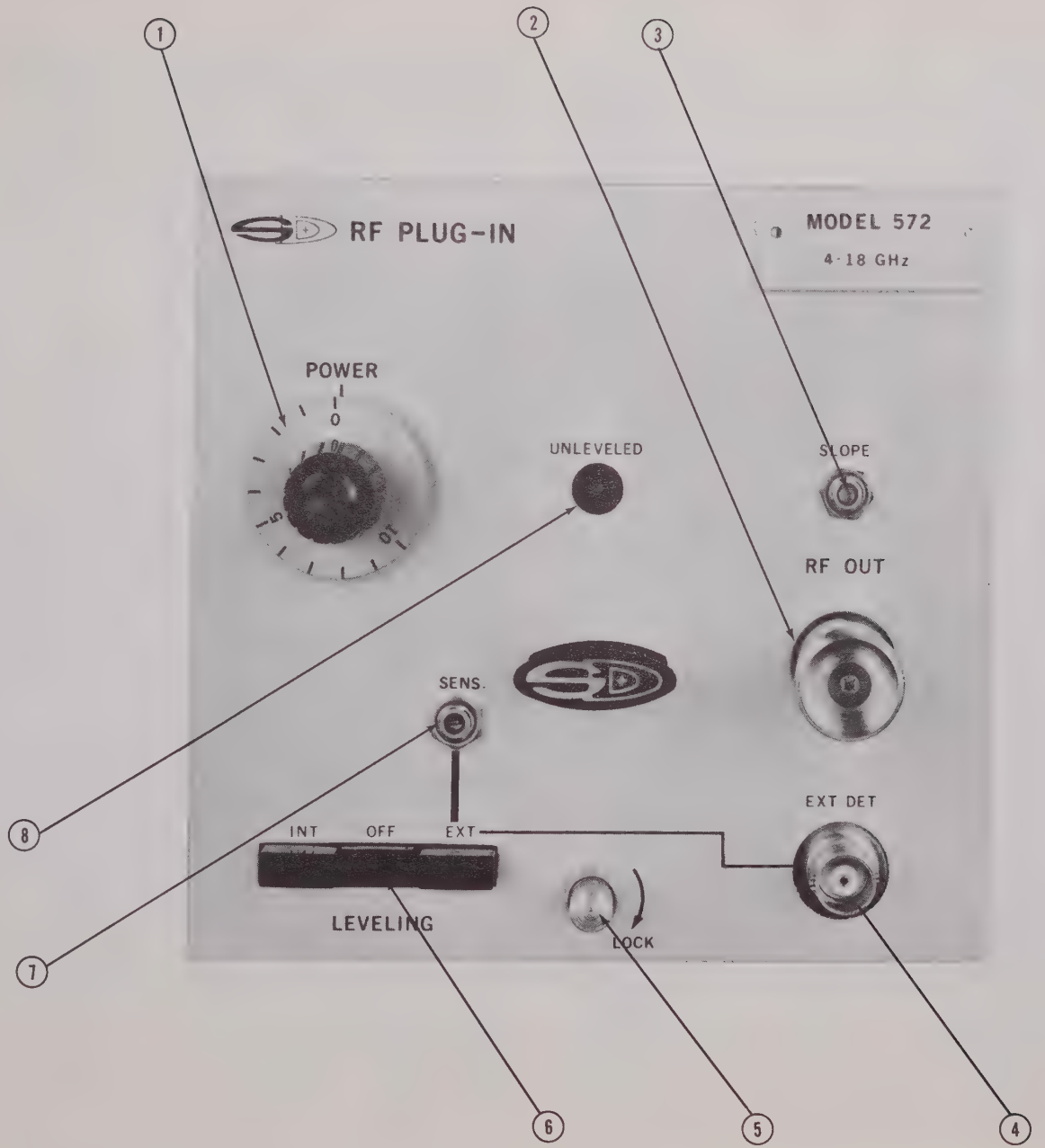

Figure 3.1 Front Panel Controls, Indicators, and Connectors

Table 3.1 Front Panel Controls, Indicators, and Connectors (Continued)

FIG. 3.1 INDEX	ITEM	FUNCTION
4	EXT DET Connector	Isolated BNC connector. The external detector signal for all bands is fed through this connector.
5	Locking Screw	Knurled knob. Used to lock RF plug-in in place in mainframe.
NOTE: This knob must be tightened to ensure low noise and proper seating of the interface connector.		
6	LEVELING Switches	Black pushbutton switches; interlocked. Select mode of amplifier leveling employed:
	INT Position	Units with Option M2 include internal power leveling; when the LEVELER switch is set to INT, the RF output is leveled at the RF OUT connector of these plug-ins without the use of an external detector. Plug-ins without internal leveling do not operate properly when the switch is set to INT: There is no control of power leveling with the RF LEVEL control; the output is either fully on or fully off.
	OFF Position	The RF output is unleveled, but the RF LEVEL control may be used for control. Maximum peak power output is available in this position.
	EXT Position	The plug-in may be externally leveled. In this position, an external negative voltage at the EXT DET connector is used to control the RF output over the frequency range of the plug-in. There is no control of power level when the leveler input is disconnected; the output is either fully on or fully off.

PRELIMINARY

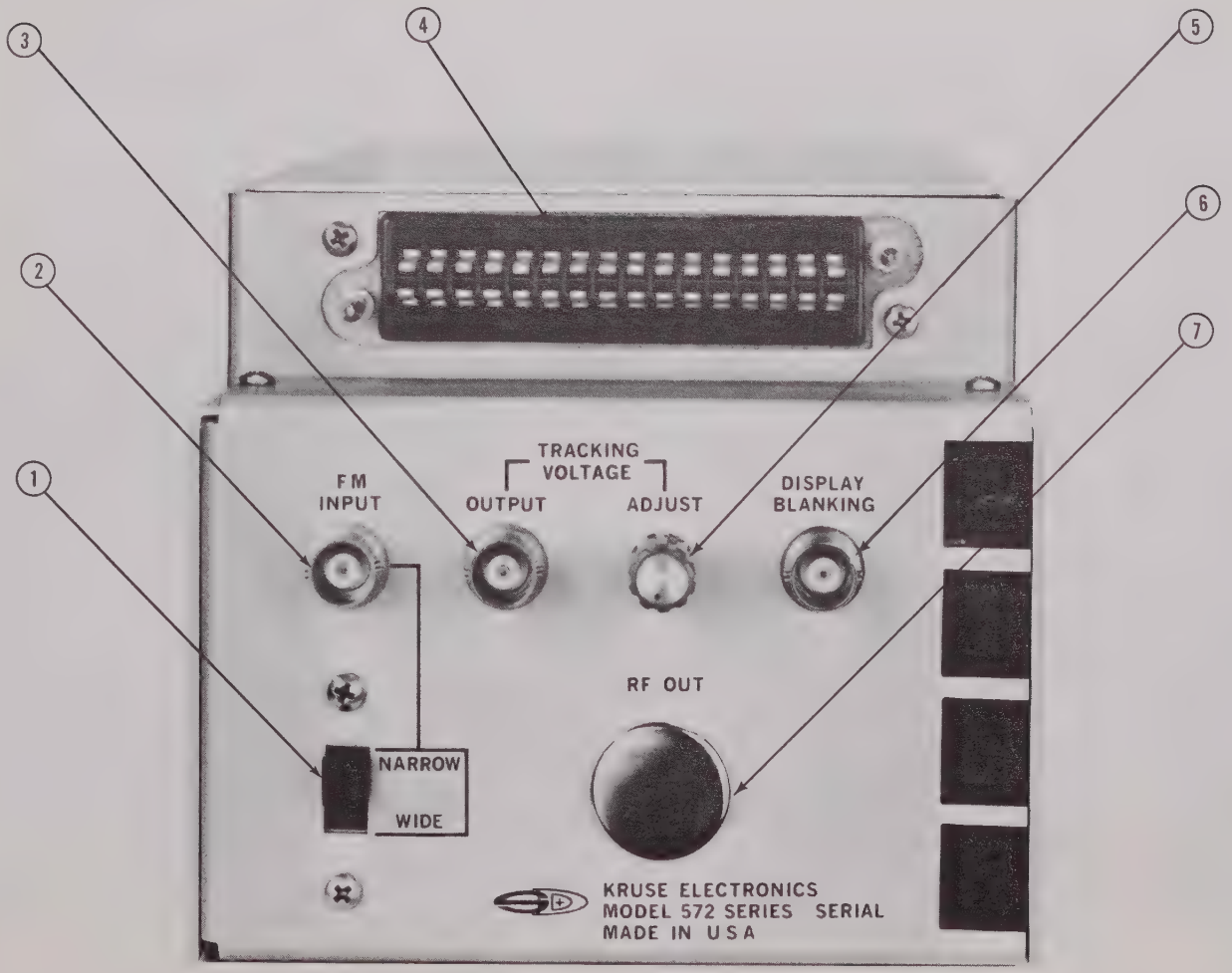

Figure 3.2 Rear Panel Controls and Connectors

Table 3.1 Front Panel Controls, Indicators, and Connectors (Continued)

FIG. 3.1 INDEX	ITEM	FUNCTION
7	SENS. Adjustment	Screwdriver-adjust potentiometer. Acts as a video load for the external detector for fastest response and as an input attenuator; adjusted for proper leveling with external leveler. Does not affect internal (Option M2) leveler.
8	UNLEVELED Indicator	Red light-emitting diode. Illuminates to indicate that LEVELING OFF pushbutton has been depressed, or that the setting of the POWER control is too high when the LEVELING INT or LEVELING EXT pushbutton is depressed; the indicator will illuminate when the external leveler is disconnected or functioning abnormally in LEVELING EXT.
Not Shown	REDUCE SWEEP SPEED Indicator	Red light-emitting diode. Used in some models to indicate that the sweep speed of the sweeper mainframe exceeds the FM capabilities of the RF plug-in. Adjust the 540 SWEEP SPEED VERNIER control to reduce sweep speed if this indicator is illuminated.

Table 3.2 Rear Panel Controls and Connectors

FIG. 3.2 INDEX	ITEM	FUNCTION
1	FM INPUT NARROW/WIDE switch NARROW Position	Slide switch. Selects mode of phase locking or FM'ing the selected oscillator: The FM input from J4 is connected directly to the fast FM coil in the selected oscillator module; frequency response is narrow.

PRELIMINARY

Table 3.2 Rear Panel Controls and Connectors (Continued)

FIG. 3.2 INDEX	ITEM	FUNCTION
1 (Cont)	WIDE Position	The input from J4 is connected to the YIG driver board of the selected band; sensitivity is 10 MHz/V.
2	FM INPUT Connector	Isolated BNC connector. The current mode signal for narrow FM'ing or the voltage mode signal for wide FM'ing may be fed in at this point.
3	TRACKING VOLTAGE OUTPUT Connector	BNC Connector. An adjustable output signal which tracks with the sweep signal is available at this point; generally used with network analyzers or to drive other voltage-controlled tracking analyzers. Maximum output level is 0 to +5 V in single band operation, +5 to +15 V in continuous band operation.
4	Interface Connector	Rear Panel 32-pin connector. Mates to connector in 540 plug-in compartment, allowing operating and signal voltages to be passed between the units. **WARNING** PIN 18 CARRIES LETHAL VOLTAGE.
5	TRACKING VOLTAGE ADJUST Control	Red knob/potentiometer. Controls the tracking voltage output level at J3 from 0 to +5 V in single band and from +5 to +15 V in continuous band operation.
6	DISPLAY BLANKING Connector	BNC connector. This connector supplies a -10 V pulse during sweep retrace or band crossover to blank the intensity circuits of the Model 7000 or other display unit. This connector, rather than the rear panel 540

PRELIMINARY

Table 3.2 Rear Panel Controls and Connectors (Continued)

FIG. 3.2 INDEX	ITEM	FUNCTION
6 (Cont)		BLANKING connector, should be used to blank the display if you wish to eliminate the intensity dots at the band crossover points in continuous sweep.
7	RF OUT Connector	When Option M2 is ordered, the RF output is on the back panel rather than on the front panel.

3.3 OPERATING NOTES

3.3.1 Internal Modulator. The 540 internal 1 kHz modulator drives the modulator of the 572 with a square wave, reducing the RF outpout of the plug-in on positive 1 kHz peaks. Most VSWR amplifiers and ratiometers will respond to the demodulated 1 kHz signal. If one of these units is being used, the 1 KHZ ADJ control on the rear panel of the 540 should be tuned for maximum response of the meter in use before measurements are made. Tuning the plug-in modulating frequency to that of the VSWR amplifier will considerably increase the measurement accuracy and signal-to-noise ratio.

3.3.2 Leveling. Leveling is the process which overcomes the natural tendency of RF sources to generate different power levels at different frequencies due to resonances, losses, and other frequency-sensitive factors. The desired end result for the 572 RF plug-in is for the power level generated at all frequencies to be identical. When a plug-in is leveled internally, the power level at the RF OUT connector is essentially flat over the specified frequency range. (Only Option M2 units include internal levelers.)

To be most useful, leveling should be accomplished as closely as possible to the point of measurement; external leveling is most desirable above 500 MHz or so due to the effects of standing waves in the coaxial cables and frequency sensitivities in other coaxial components in a given test setup. When external leveling is used, the power level at the output of the leveler is essentially identical for all output frequencies. The front-panel SENS. adjustment should be set to the position which produces the desired sensitivity (mV/mW) and best square-law response.

3.3.3 Band Selection. Band selection is determined by the setting of the 540 front-panel BAND SELECT switch. When this switch is set to the Band 1 position, the solid-state band switch/modulator fully attenuates the outputs of oscillators 2 and 3, and allows the RF output of oscillator 1 to pass with minimum attenuation. The action is similar when the BAND SELECT switch is set to any of the other single-band positions.

When the band switch is set to the Band 4 position, the continuous sweep circuitry of the 572 is used to operate all single bands sequentially for each 0 to -10 V sweep ramp from the 540. If the display blanking output of the 572 is not used, you will see brightened intensity dots at each band crossover point. This is due to the fact that the 540 sweep is stopped during crossover, and the CRT beam of the display unit does not move during the crossover period.

If you wish to use these band crossover markers, do not connect the blanking input of your CRT display unit to the 572 rear-panel DISPLAY BLANKING connector, but to the 540 BLANKING connector.

3.3.4 FM Inputs. The 572 may be frequency modulated in two ways: when the rear-panel WIDE/NARROW switch is set to NARROW, FM INPUT connector J4 feeds the fast FM coil of the selected oscillator directly. A current driver is required; maximum current is + or - 75 mA. The shell of the FM INPUT connector is isolated from ground so that remote current sensing may be used. The sensitivity varies with oscillator frequency.

When the switch is set to WIDE, J4 feeds the YIG (oscillator) driver boards rather than feeding the oscillator directly. A voltage source is required; sensitivity is a constant 10 MHz/volt at any frequency.

The output of a discriminator is often used to lock the output frequency of the 572 oscillator to an external standard; AC-coupled audio-frequency outputs are often used when it is desirable to generate a CW or swept FM signal.

3.3.5 Slope Compensation. The output of the 572 is automatically compensated for the flattest possible output when an external or internal (Option M2) leveler is used. However, the natural tendency is for the insertion loss of cables to increase with increasing frequency; the rolloff is 6 dB per octave. If you wish to compensate for this predictable loss, and it is not possible to level the 572 at the point to be measured, you may wish to adjust the front-panel SLOPE control to "pick up" the high frequency end of the sweep.

SECTION 4

THEORY OF OPERATION

4.1 GENERAL

The descriptions in this section of the 572 circuitry are based upon the schematic diagrams in Section 6. Remember that descriptions of the sequential sweep circuits in this section apply to all 572 series plug-ins except the 572-104.

Figure 5.1, in Section 5, shows the locations of some of the components described in this section.

4.2 CIRCUIT DESCRIPTIONS

4.2.1 Oscillators. The oscillators are sealed assemblies, each containing a Gunn diode RF source and a YIG (Yttrium-Iron-Garnet) filter; the filter is tuned by the sweep signal from the 540 which has been processed by one of the YIG driver boards.

The operating point of the broadband Gunn diode source is determined by the bias voltage (VB+ and VB-) from the YIG driver; the exact frequency of the oscillator is determined by the current through the tuning coil of the YIG material (SW+ and SW-).

Ferrite isolators are used between the output of each oscillator and the band switch; these isolators protect the oscillator from damage which might be caused by operating into a mismatched load, and reduce the effect a mismatch might have upon oscillator frequency. At the same time, they present a constant source impedance to the band switch, allowing it to operate more predictably.

4.2.2 YIG Drivers. The YIG driver board converts the linear 0 V to -10 V sweep, or the - V to -10 V level in CW or manual scan from the 540 mainframe to a sweep signal or voltage which matches the non-linear characteristics of the YIG tuning coil in the driven oscillator. The YIG driver board also accepts an FM input (when the WIDE/NARROW switch is set to WIDE) for frequency locking or FM'ing the oscillator. Adjustments for setting starting, stopping, and maximum frequency limits are on the YIG driver board.

4.2.3 Leveling and Amplitude Modulation Circuits. The leveling circuits comprise switches A1S1 through A1S3 and operational amplifiers A1IC1 and A1IC2 on the mother board.

The output of an internal leveling detector (Option M2 only) is selected when the LEVELING INT pushbutton has been depressed; amplifier A1IC4 increases the level of this signal and couples it through resistor A1R2 to the summing junction of operational amplifier A1IC2.

Amplifier A1IC4 is also used as a preamplifier when the LEVELING EXT pushbutton is depressed; the output of an external leveling detector is fed through front-panel connector J5, amplified by A1IC4, and fed through A1R2 to the summing junction of A1IC2.

In addition to the leveling voltage to the summing junction of amplifier A1IC2, three other amplitude control voltages are fed through A1R5, A1R3, and A1R4. These are power control from R5, external amplitude modulation from the EXT AM connector on the rear panel of the 540, and internal modulation from the AM board. The 540 generates a 1 kHz modulation signal as well as a control voltage to turn the modulator completely off when the 540 RF OFF pushbutton has been depressed. These three signals, plus the leveling signal from A1IC4, comprise the total of the inputs to the summing junction of operational amplifier A1IC2.

4.2.4 Band Switch and Modulator Driver Circuits. Positive drive will increase the conductivity of the PIN diodes in the band switch/modulator, and increase the attenuation of the band for which drive is provided. When Band 1 is selected, the output at mother board pin A goes low, while the outputs at pins B and C remain high; the output of oscillator 1 is allowed to pass with minimum attenuation. When Band 2 is selected, pin B goes low and pins A and C go high; only pin C goes low when Band 3 is selected. In the continuous sweep (Band 4) mode of operation, the PIN diode drivers go low in sequence.

The output of AM amplifier A1IC2 is fed to the selected PIN diode driver circuit, and is used to increase the positive drive (attenuation) of the selected band as determined by the leveling and AM drives to A1IC2.

Operational amplifier A1IC17 forms a regulated power source used to bias the band switch/modulator assembly PIN diodes.

4.2.5 Slope Compensation. Operational amplifier A1IC20 is driven by the frequency reference (sweep) signal from the 540 mainframe, and generates a compensating offset signal which is subtracted from the voltage available at the top of POWER control A1R5.

4.2.6 UNLEVELED Indicator. Operational amplifier A1IC3 monitors the differential voltage between the A1CR2/A1CR4 junction and a reference voltage at the A1R16/A1R18 junction; when this voltage exceeds a predetermined value, the output of comparator A1IC3 turns on transistor A1Q1, which illuminates light-emitting diode (LED) CR2. CR2 is always lighted when the LEVELING OFF pushbutton has been depressed.

4.2.7 Single Band Operation. In Band 1, or any other non-sequential band, the frequency tuning voltage to oscillator 1 is controlled by the 0 V to -10 V sweep from the 540

mainframe, as modified by the YIG driver. This 0 V to -10 V sweep corresponds to the full band range; a smaller voltage will sweep a proportionally smaller part of the band.

As the schematic diagrams shown, relays A1K1 through A1K3 on the mother board are all de-activated when the 540 band switch is set to any position other than "4". Relay A1K1 connects the frequency reference input of the YIG driver board directly to the sweep output of the 540 mainframe when the band switch is set to "1". In addition, when the 540 mainframe band switch is set to the Band 1 position, pin 4 of A1IC15 is grounded. This drives the Band 1 PIN diode drivers off, resulting in minimum attenuation for oscillator 1 and maximum attenuation for oscillators 2 and 3.

4.2.8 Continuous Band Operation. When the 540 BAND SELECT switch is set to "4", relays A1K1, A1K2, and A1K3 on the plug-in mother board are activated; this disconnects the tuning voltage input of the YIG (oscillator) driver boards from the frequency reference (sweep) input, and connects them to the outputs of operational amplifiers A1IC6, A1IC5, and A1IC4, respectively. Instead of being driven directly by the 0 to -10 V sweep from the 540, the oscillator drivers are now driven by 0 to -10 V sweeps from these operational amplifiers. The offsets and gains of the amplifiers are adjusted so that each amplifier generates a 0 to -10 V sweep during approximately 1/3 of the sweep ramp from the 540.

In general, A1IC6 responds to the 0 to -3 V portion of the sweep ramp by offsetting and amplifying it to a 0 to -10 V ramp which levels off at -10 V; A1IC5 offsets and amplifies the -3 to -7 V portion of the sweep to another 0 to -10 V ramp which begins as the ramp from A1IC6 levels off. The -7 to -10 V portion of the ramp drives A1IC4. These voltages are only generally accurate, as the description given is a simplification of the actual process. In sequential mode, A1R54 is the Band 1 offset (start frequency) adjustment, A1R38 is the Band 1 gain (stop frequency) adjustment, A1R66 and A1R35 are the offset and gain adjustments for Band 2, and A1R70 and A1R32 are the offset and gain adjustments for Band 3. The upper frequency limit for each band is set by variable resistor R22 on the appropriate oscillator driver board in continuous sweep mode as well as in single band mode; this determines the point at which the sweep levels off to -10 V.

Operational amplifier A1IC7 is a unity-gain voltage vollower which acts as a buffer between the frequency reference output of the 540 and the inputs of A1IC6, A1IC5, and A1IC4.

The crossover point between Band 1 and Band 2 is determined by the setting of variable resistor A1R69; when the frequency reference voltage from the 540 which corresponds to the Band 1/Band 2 crossover frequency is reached, A1IC10 causes the Band 1 PIN driver to go low for minimum attenuation, and leaves the Band 3 PIN driver high for full attenuation. A1R57 sets the Band 2/Band 3 crossover point.

4.2.9 Display Blanking. When monostable multivibrator A1IC21 changes state at a band crossover point, it provides a low output for $\approx$ 3 mS to pin V of the mother board and one input of NAND gate A1IC12A. The pin V output is used to stop the 540 sweep during crossover.

Except during sweep retrace time, the blanking input at pin 10 of A1IC12A is high; when the input at pin 9 goes low at crossover, the NAND gate drives transistor A1Q4 "on"; a -10 V display blanking pulse is coupled through A1CR30 to connector J2. This eliminates the sweep stop dot that would be seen on the CRT display if it were not blanked at crossover.

The display is also blanked during sweep retrace because the input to pin 10 of A1IC12A goes low; since the pin 9 input is low only at crossover, the inputs are not coincident and A1Q4 is driven "on".

SECTION 5

MAINTENANCE

5.1 ROUTINE MAINTENANCE

The 572 does not require routine maintenance or calibration; it should of course be kept free of dust and dirt, but no regularly-scheduled maintenance is necessary. Clean the filter and vacuum out the cooling air channel as required.

5.2 CORRECTIVE MAINTENANCE

5.2.1 General. Field repair of the RF plug-in is not recommended. The oscillator, heart of the plug-in, is not a field-repairable item. Replacement oscillators can be supplied for replacement in the field, but the following facts should be kept in mind:

- Many oscillators can be repaired at the factory, at far lower cost than that of a new oscillator.
- Even after an oscillator has been replaced, the plug-in unit will still have to be calibrated by the selection of precision fixed components. This is a job best done at the factory.
- The plug-in unit and oscillators are covered by a one or two-year warranty; refer to the front of this manual. Attempted repair may void this warranty.

5.2.2 Trouble Isolation. If the 572 is to be repaired in the field, it is necessary that a Model 593 plug-in extender be available. Access to the unit is otherwise severely limited.

WARNING

PIN 18 OF THE INTERFACE CONNECTOR CARRIES LETHAL VOLTAGE.

Standard troubleshooting techniques should be used to locate defective components.

CAUTION

BE VERY CAREFUL WITH OSCILLOSCOPE AND VOLTMETER PROBES TO AVOID ACCIDENTALLY BRIDGING TWO POINTS OR SHORTING A COMPONENT LEAD OR WIRE TO GROUND. LACK OF ADEQUATE CARE WITH SEMICONDUCTOR CIRCUITS CAN TURN RELATIVELY MINOR PROBLEMS INTO COSTLY REPAIRS.

It is necessary to have available special test point extenders and testing tools for servicing the DIP integrated circuits on the A1 board. A test set such as the Hewlett Packard Model 5010A Logic Troubleshooting Kit or the 10528A Logic Clip is most valuable.

Repair of the plug-in is limited to location and replacement of defective components. To avoid damage to the printed circuit card and to precision components, solder or remove components only with a low power (25 to 50 W, 500 to 650°) soldering iron. Do not use soldering guns or large irons. Use only 60-40 or 63-37 rosin core solder. To remove the integrated circuit operational amplifiers or the FET differential amplifier, use a special iron tip that unsolders all leads at the same time (available from Ungar and other manufacturers). Remove excess solder from circuit card holes with a vacuum device.

5.3 CALIBRATION ADJUSTMENTS

Under normal circumstances, the RF plug-in should not be calibrated in the field; once the adjustments for starting frequencies, stopping frequencies, and frequency limits have been set at the factory, there should be no need to change them.

Figure 5.1 shows the locations of all adjustments accessible from the top of the plug-in. Figure 5.2 shows the locations of the adjustments accessible from the bottom of the plug-in.

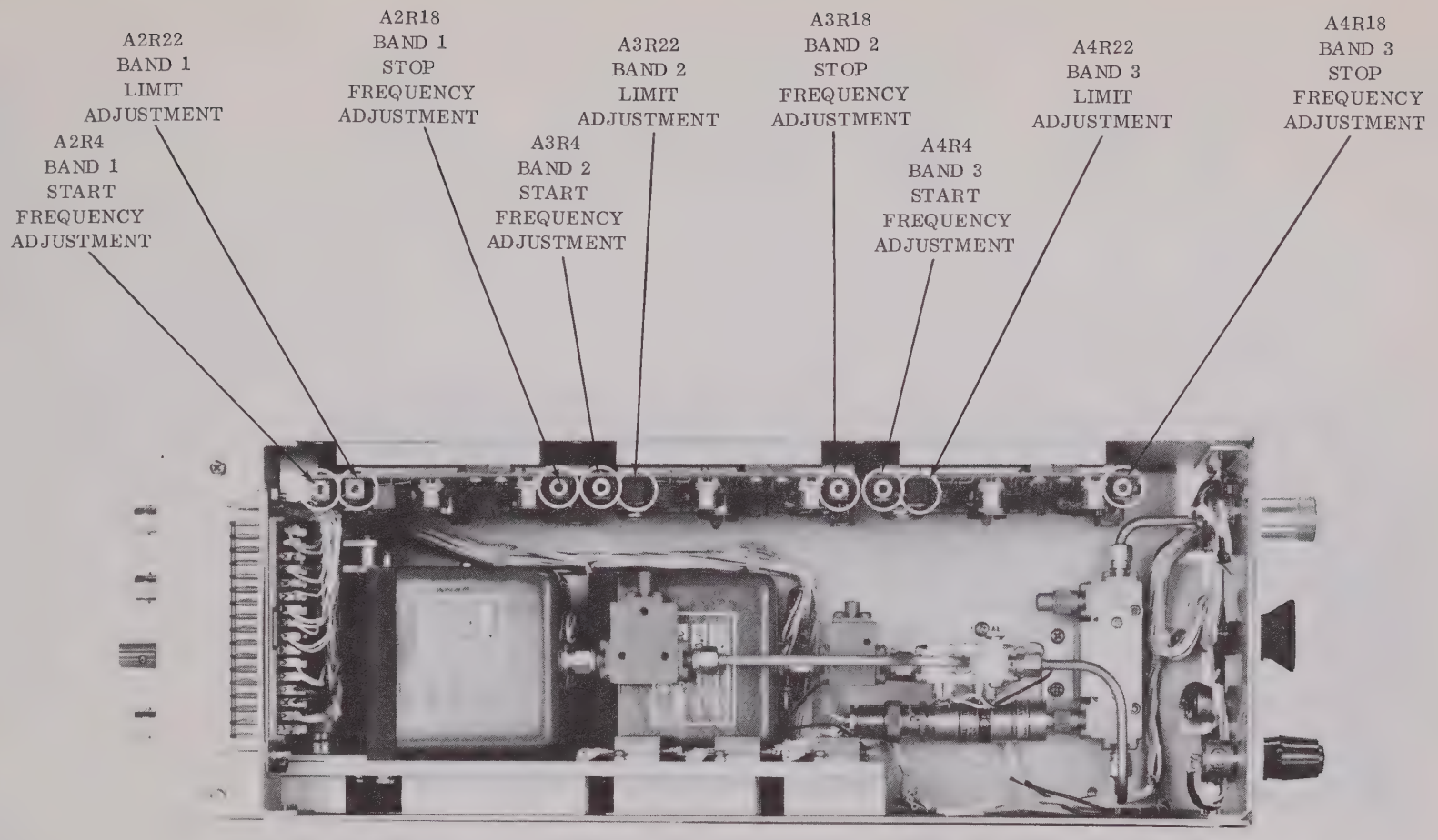

Figure 5.1 Model 572 Top-Panel Adjustments

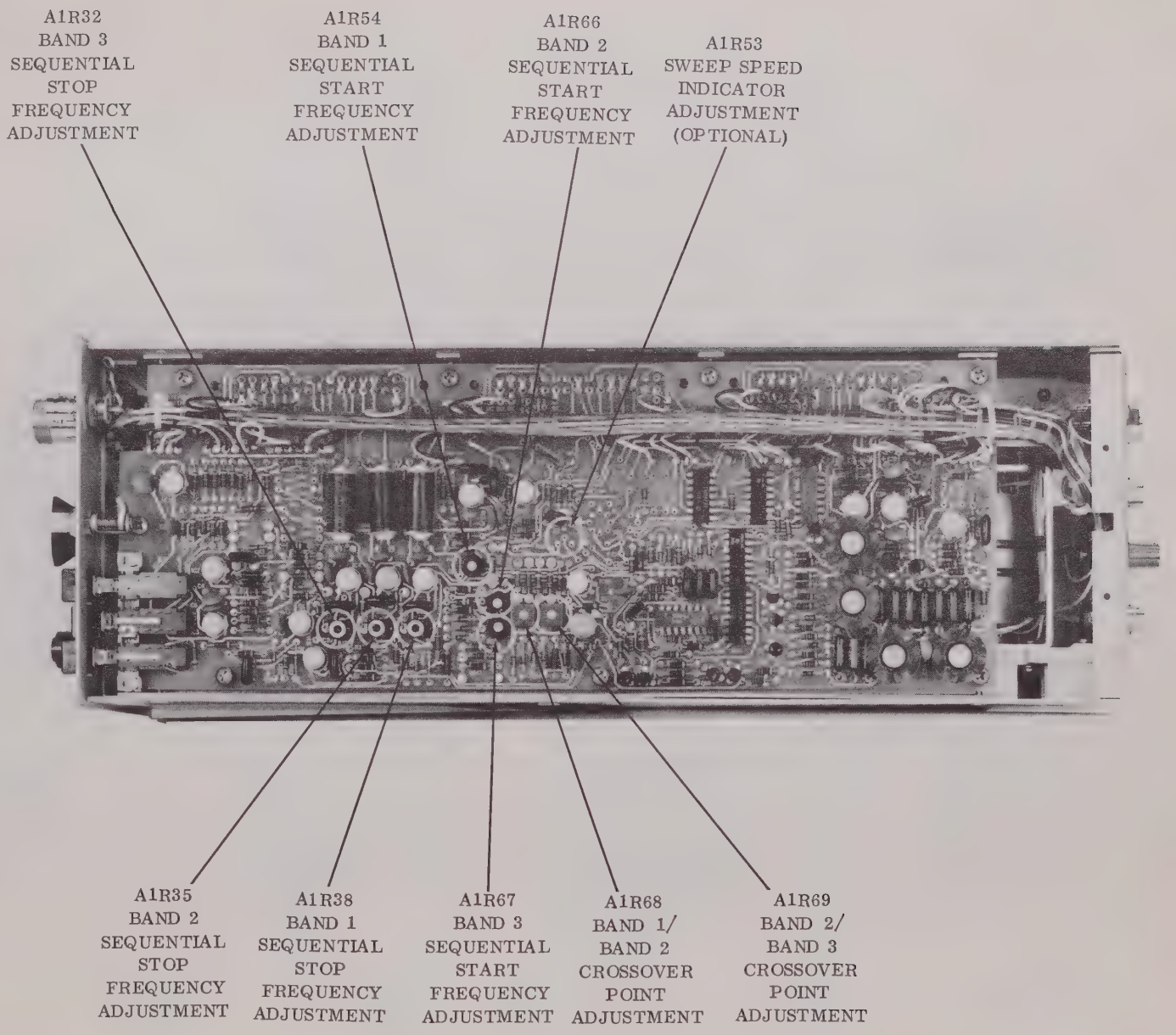

Figure 5.2 Model 572 Bottom-Panel Adjustments

SECTION 6

SCHEMATIC DIAGRAMS

6.1 INTRODUCTION

This section contains the schematic diagrams for the Kruse Electronics Model 572 RF Plug-in. The information is arranged in the following order:

- Sequential Sweep Mother Board (A1) Schematic Diagram
- YIG Driver Board (A2, A3, and A4) Schematic Diagram

6.2 REPLACEMENTS

Many replacement parts for the plug-in are available locally, but needed parts can be ordered from the Kruse Electronics division of Systron-Donner Corporation at the address shown on the front cover of this manual.

Be sure to give the complete reference designation for all parts ordered; this would comprise the instrument model number, board upon which the part is located, and component number. Therefore, capacitor C5 on Board A1 must be referred to as 572A1C5. Also include the Kruse part number of the required component, if known, and the serial number of the plug-in for which the part is required (the serial number is stamped on the rear panel).

DATE	SYM	REVISION RECORD	AUTH	DR	CY
		SEE SHT 1			

REF. DESIGN.	4-8 AVANTEK	8-12.4 VARIAN	12.4-18 VARIAN	4-6 AVANTEK	4-7 AVANTEK	7-11 VARIAN	7-12 VARIAN	12-18 VARIAN	12.4-18.5 VARIAN	7.5-12.0 VARIAN	[illegible]
R2	39K	62K	56K	39K	39K	68K	68K	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5K	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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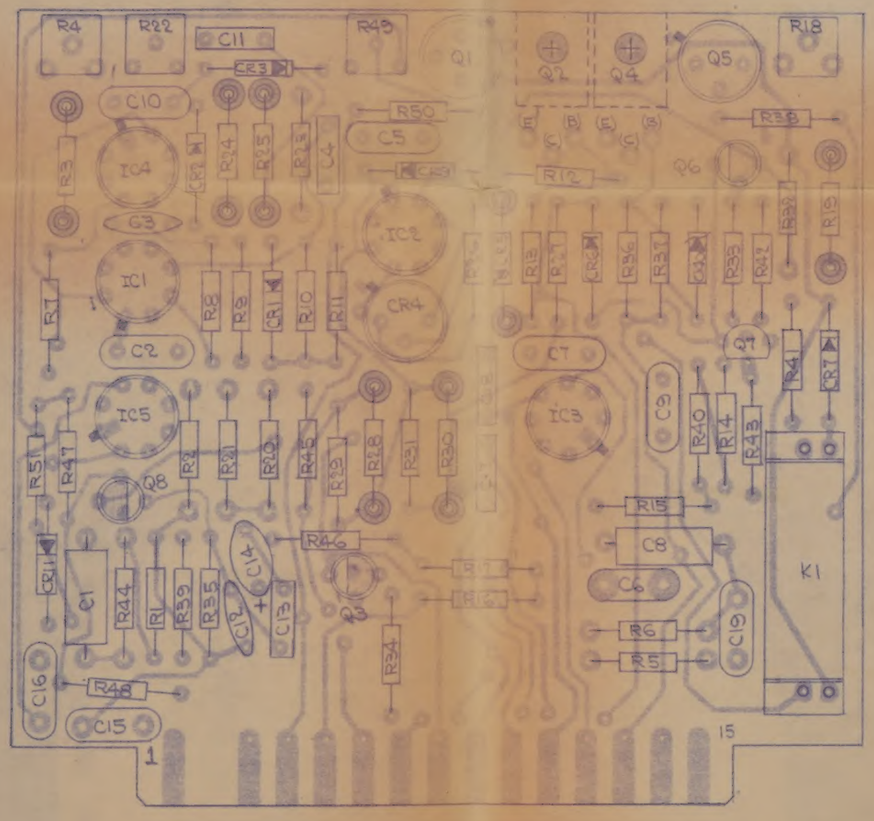
C1	.001uf	.01uf	.01uf	[illegible]	[illegible]	.01uf	.01uf	.01uf	.01uf	.01uf	.01uf
C4,C6	10pf	5pf	5pf	[illegible]	[illegible]	5pf	5pf	5pf	3pf	5pf	[illegible]
L3	10 pf	39 pf	27 pf	[illegible]	[illegible]	39 pf	39 pf	33 pf	[illegible]	39 pf	[illegible]
[illegible]	IN5947	*	*	[illegible]	[illegible]	*	*	*	*	*	*
[illegible]	.001uf	.0033uf	.0033uf	[illegible]	[illegible]	.0033uf	.0033uf	.0033uf	[illegible]	.0033uf	.0033uf

TOLERANCES (EXCEPT AS NOTED)			
DECIMAL ±	[illegible]	SCALE	DRAWN BY
FRACTIONAL ±	TITLE [illegible]		APPROVED BY
ANGULAR ±	DATE	DRAWING NUMBER	

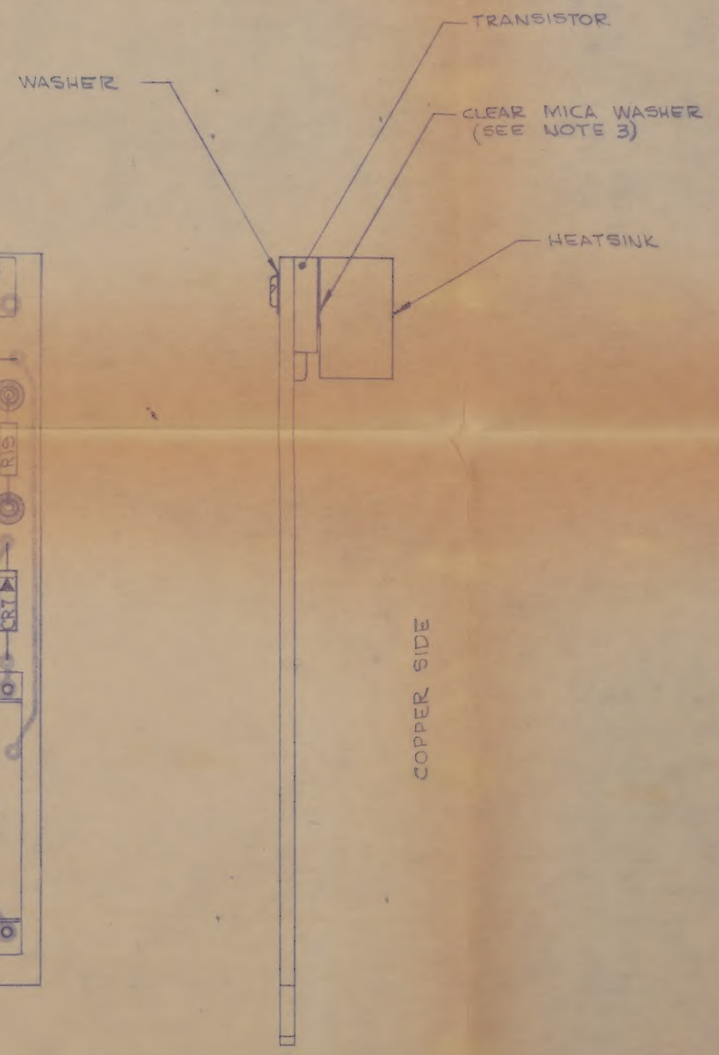
NOTES:

1. INSTALL TRANSISTOR PAD UNDER Q1, Q2, Q3, Q4 AND Q5.
2. AFTER WASHING, INSTALL HEAT DISSIPATOR ON Q1, Q2, Q3, Q4 AND Q5.
3. AFTER WASHING, HAND SOLDER W1 CONNECTORS; R31, R47, R38, R54, R44, R47 AND R51 SWITCH ASSY: S1, S2, S3. J1 AND J2.
4. INSTALL TIE CORDS LAST WITH
5. FOR SCHEMATIC SEE DWG. D9004 T
6. FOR MATERIAL LIST SEE ML 950474
7. MARK APPLICABLE REV. LETTER.

DATE	SYM	REVISION RECORD	AUTH		
2-28-73	A	PRE. PROD. REL.	MED 002	LK	
5-9-73	B	REVISED PER ECO	447	WD	



SEE NOTE 4



NOTES:

1. INSTALL TRANSISTOR PAD UNDER Q1, Q5 AND CR4.
2. AFTER WASHING, HAND SOLDER R4, R22, R49 & R18; AND INSTALL Q2 AND Q4 PER NOTE 3.
3. INSTALL Q2 AND Q4 WITH INCLUDED HARDWARE AS SHOWN ON SIDE VIEW. SPECIAL ATTENTION: LOAD TRANSISTOR WITH THE EXPOSED METAL SURFACE NEXT TO THE CLEAR MICA WASHER.
4. LOADED BOARDS ARE TO BE KEYED PER KEY LOCATION CHART C948354.

TOLERANCES (EXCEPT AS NOTED)	KEUFFEL & ESSER CO. / EVERETT DIVISION / LYBYRON CORPORATION / DONNER		
DECIMAL ± ~	USED ON: 572 QTY PER UNIT: A/R	SCALE 2:1	DRAWN BY L.K. APPROVED BY R. Cruse
FRACTIONAL ± ~	TITLE: LOADING DIAGRAM 572 YIG DRIVER CARD (VARIAN/AVANTEK)		
ANGULAR ± ~	DATE 3-26-73	DRAWING NUMBER C-946274	REV B

MP MASTER
MA34061